Characterizing Carver and White's BIS/BAS subscales using the Five Factor Model of personality

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ABSTRACT

This study examined BIS/BAS scales (Carver & White, 1994) assessment of Gray's revised Reinforcement Sensitivity Theory in the light of the Five-Factor Model of personality—assessed via NEO-PI-R domains and facets—in a mixed-gender sample of 329 undergraduates. Exploratory factor analysis confirmed a 5-factor solution structure of the BIS/BAS scales, with BIS-scale divided into BIS-Anxiety and BIS-Fear factors, besides the original three BAS factors. BIS-Anxiety was found to represent Gray's anxiety (high Neuroticism and low Extraversion), being also distinguished from BIS-Fear by high Agreeableness, as expected. Interestingly, Conscientiousness showed divergent relationships to BIS-Anxiety (+) and BIS-Fear (−) as well. It is noteworthy that Agreeableness and Conscientiousness also marked distinct facets of BAS-related activity: distinctions in terms of low vs. high Conscientiousness pointed to differential measure of sensation-seeking and impulsiveness (BAS-Fun Seeking) vs. reward-orientation in goal-directed behavior (BAS-Reward Responsiveness, BAS-Drive), with low Agreeableness additionally emphasizing a competitive interpersonal style for approaching goals (BAS-Drive). Our findings suggest that BAS total scores could be obscuring differential associations at the subscales level, and encourage further research on personality traits underlying each component of BAS activation.

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1. Introduction

Jeffrey A. Gray's Reinforcement Sensitivity Theory (RST; Gray, 1970, 1982, 1987, 1991; Gray & McNaughton, 2000) is now one of the most influential neuropsychological models of personality. In its original version, the RST encompassed three major brain systems underlying individual differences in behavior and personality in response to environmental stimuli. The Behavioral Approach System (BAS) was activated by conditioned appetitive stimuli (i.e., signals of reward or non-punishment), eliciting approach behavior toward desired goals. It was proposed as the basis of impulsivity, and was hypothesized to relate positively to Eysenck's Extraversion and Neuroticism. The Behavioral Inhibition System (BIS) was activated by conditioned aversive stimuli (i.e., signals of punishment or non-reward) and intense or novel/unexpected stimuli, resulting in the interruption of ongoing behavior and simultaneous direction of attention toward the potential threat. It was associated with the experience of anxiety and should be positively related to Eysenck's Neuroticism, but negatively to Extraversion. The Fight/Flight System (FFS) was activated by unconditioned aversive stimuli, provoking defensive aggression or escape behavior—and being related to the emotional states of rage and panic, and likely with Eysenck's trait of Psychoticism (Gray, 1981; see Heym & Lawrence, 2010, for a revision of the role of Psychoticism in Gray's RST).

Gray and McNaughton (2000) updated RST in order to incorporate data from neurophysiological animal research of anxiety and studies designed to test RST in the human experimental laboratory (see Corr, 2004, 2008, for an extensive revision). In the revised model, the BAS remains mediating reactions to appetitive stimuli—but now including also unconditioned ones—, and is associated with extraversion, reward-orientation, and impulsiveness. Conversely, the FFS now mediates responses to both unconditioned *and conditioned* aversive stimuli and, importantly, it is now related to the emotion of fear, not anxiety. Finally, the BIS is turned into a conflict detection system, responsible for resolving all goal conflicts between reward and/or punishment contingencies. This generates the emotion of anxiety, which is subjectively experienced as worry and rumination (Gray & McNaughton, 2000). Thus, revised RST highlighted the need to distinguish FFS and BIS at the level of personality so as to reflect the dissociation between fear and anxiety found at neurophysiological and behavioral levels (cf. Corr & McNaughton, 2008), even though a general factor of Neuroticism likely relates to both systems (McNaughton & Corr, 2004).

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However, it is unclear how self-report questionnaires developed to measure personality such as conceptualized in Gray's original RST can tap individual differences in anxiety and fear now underlying the new BIS and FFS systems, respectively. Concerning this, Corr and McNaughton (2008) suggested that anxiety and fear could be distinguished within the existing BIS-scale of one of the most widely used measures of original RST, the Carver and White (1994) BIS/BAS scales. In fact, Johnson, Turner, and Iwata (2003) identified two items of the BIS-scale—which explicitly mention the word "fear"—loading on a separate factor from the other items, and, later, Heym, Ferguson, and Lawrence (2008) suggested the inclusion of a third item. The remaining four-items of the BIS-scale, whose content captures the notion of worry about making mistakes or social comparison, are instead related to the emotion of anxiety (see Smillie, Pickering, & Jackson, 2006). The first systematic studies testing the structure of the BIS-scale have supported both the two- (e.g., Beck, Smits, Claes, Vandereycken, & Bijttebier, 2009; Poythress et al., 2008) and the three-item BIS-Fear scale solution (e.g., Dissabandara, Loxton, Dias, Daglish, & Stadlin, 2012; Heym et al., 2008). These mixed findings have been attributed to differences in the samples used—offenders and clinical patients vs. undergraduates, respectively (Dissabandara et al., 2012).

With respect to the approach system, it should be noted that there is a considerable controversy about what the BAS-related personality trait is. Gray assumed that individuals high in impulsivity are more sensitive to reward signals, and employed the term "impulsivity" for the personality trait reflecting BAS sensitivity. However, several studies emphasize a distinction between impulsivity (which provokes behaviors that are rash and spontaneous) and sensitivity to unconditioned/conditioned rewarding stimuli (for a review see Franken & Muris, 2006; Poythress & Hall, 2011). Indeed, Carver and White developed three scales to assess BAS activity: Drive (BAS-DR) items relate to the strong pursuit of appetitive goals, Reward-Responsiveness (BAS-RR) items focus on positive responses to the occurrence of reward, and Fun-Seeking (BAS-FS) items reflect both a tendency to seek out new potentially rewarding experiences and a tendency to act on the spur of the moment. There is now growing experimental evidence indicating that BAS-DR and BAS-RR are associated with reward sensitivity, whereas BAS-FS is more related to rash impulsiveness and sensation seeking (e.g., Smillie & Jackson, 2006).

Inasmuch as they seem adequate to capture individual differences in reward and punishment responsiveness proposed in Gray's original and revised RST—the most important behavioral and physiological model of personality—, BIS/BAS scales have been linked to other major personality theories such as the Five-Factor Model (FFM; Costa & McCrae, 1992). In the first study examining relationships between BIS/BAS scales and FFM domains, Smits and Boeck (2006) found that the original BIS-scale was positively related to Neuroticism, Agreeableness, and Conscientiousness, and negatively to Extraversion. With regard to the BAS, all three scales were positively related to Extraversion, but other FFM domains showed specific associations only with certain BAS subscales: BAS-FS was positively related to Openness and negatively to Agreeableness and Conscientiousness, while BAS-DR was unrelated to Openness, negatively related to Agreeableness and positively related to Conscientiousness. These data suggested that BAS-FS is preferentially reflecting impulsivity, sensation-seeking, and low constraint, while the other BAS scales tap distinctive—albeit related—constructs. However, this study explored relationships for RST systems only at the FFM domain level, and, remarkably, without considering the BIS-Anxiety and BIS-Fear distinction.

Recently, Keiser and Ross (2011) overcame these limitations by examining the revised BIS-Anxiety and BIS-Fear scales, besides overall BAS, in relation to the domains and facets of the FFM. Neuroticism and Conscientiousness were positive predictors of both BIS-Anxiety and BIS-Fear, and the Agreeableness domain—and its specific facets of Compliance and Modesty—also positively predicted BIS-Anxiety, but not BIS-Fear. Overall BAS was positively predicted by Extraversion and negatively by Agreeableness. Unfortunately, differential relationships between BAS subscales and the FFM were not investigated. This fact is of particular importance in light of the debate about which personality traits exactly underlie BAS activity, and the reported interrelations between the BIS and BAS subscales (e.g., Heym et al., 2008), which highlight the need to control for the effects of each subscale on the others when examining relations with criteria variables.

In view of limitations of previous research, our study was aimed to delineate differences among BIS/BAS subscales from the FFM, both at the domain and facet level, distinguishing BIS-Fear from BIS-Anxiety within the original BIS-scale and parsing the BAS construct into separate BAS-DR, BAS-RR, and BAS-FS. To this end, we first examined the factor structure of the Spanish version of the BIS/BAS scales to check whether the division of the original BIS-scale into two factors was confirmed. Secondly, we explored the relations of each BIS/BAS subscale with the facets and domains of the FFM—assessed by the NEO-PI-R—in order to clarify the differential personality patterns underlying the updated RST.

2. Method

2.1. Participants and procedure

Participants were 329 undergraduates (45% males) from Universitat Jaume I of Castellón (Spain), with a mean age of 20.23 years (SD = 2.72). All participants provided informed consent, completed the questionnaires anonymously in small group sessions of 20–40 students, and were paid 12 € for their participation.

2.2. Measures

The BIS/BAS scales (Carver & White, 1994) consist of 24 items: 7 items designed to assess BIS reactivity, 13 items designed to assess BAS activity through three subscales—Drive (BAS-DR; 4 items), Fun-Seeking (BAS-FS; 4 items), and Reward-Responsiveness (BAS-RR; 5 items)–, and 4 filler items. Each item is scored using a 4-point Likert scale from "strongly agree" to "strongly disagree". In a Spanish sample of undergraduates (Caseras, Ávila, & Torrubia, 2003), α coefficients ranged from 0.65 to 0.82.

The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Ávila, Moltó, & Caseras, 2001) is a 48-yes/no questionnaire designed to assess individual differences in Gray's dimensions through two scales: Sensitivity to Punishment (SP; 24 items) and Sensitivity to Reward (SR; 24 items). In the current study, α coefficients were 0.86 for SP and 0.79 for SR.

The Anxiety-Trait Scale (STAI-T) from the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) is a 20-item measure of anxiety as a general trait that is answered on a four-point Likert scale from "almost never" to "almost always". In the current study, α coefficient was 0.87.

The Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) is a 240-item Likert questionnaire, ranging from "strongly disagree" to "strongly agree". It was designed to assess the personality domains of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. Each domain is composed of six facet scales. In the current study, α coefficients were 0.90 for Neuroticism, 0.88 for Extraversion, 0.87 for Openness, 0.89 for Agreeableness, and 0.91 for Conscientiousness. At the facet level,